50X1-HUM

A STUDY OF THE INCREASE OF PRODUCTION OF FERTILIZERS AND OF FUNGICIDES

As announced in our last issue, we give here a full review of the study of the increase in the production of fertilizers and of fungicides submitted to the last session of the Economic Council of the Syndicates.

The president of our Syndicate stated that the findings of this study are definite and pointed out that we have to start out with the fact that the national agricultural production shows a deficit or a difference between production and demand of 35 percent, based on the production figures previous to 1936, with both figures based on national needs. This deficit has undoubtedly been caused to a large extent by outside circumstances beyond our control, which were created by the war and by the post-war period.

But this hard reality should not be discouraging; on the contrary, it should serve as a stimulus for remedying this condition, for we face the necessity of providing the growing Spanish population with their daily needs, which requires the utilization of our full potential and the constant study of those forms and means which the soil of Spain and the Spanish people allow us to put into effect.

Among the means for improving agricultural production, the three following ones are the most important:

1) Agricultural equipment (machinery, animal and mechanical motive power)

2) Fertilizers and fungicides

3) Selected seeds

The first of these problems is certainly the most difficult to solve, because of the question of availability of the large quantities of equipment required by Spanish agriculture which is backward as far as mechanization is concerned and employs primitive methods of cultivation in large areas. The situation can be improved only by large imports, but appreciable results would necessitate quantities of imports which we cannot possibly obtain with our present reserves of

foreign currency.

On the other hand, the two other aims, those pertaining to fertilizers and selected seeds, are, by their nature, perfectly well attainable. These problems can be solved or appreciably alleviated by the use of the national resources, if they are employed with rational priorities, and, as has been said before, by using essential materials only for productive purposes, so that an increase will be achieved, along the same lines as has been shown by the industrial studies on the increase of production of coal, steel and cement. As far as the production of selected seeds is concerned, this problem still has to be fully demonstrated, while we shall now discuss it as far as it concerns fertilizers. In order to obtain sufficient quantities of these essential materials or products, the Director of National Economics Planning must set up the proper written priorities.

Structure:

There are two fundamental divisions of the problem, corresponding to the two phases which concern the authorities, namely:

First: Examination and analysis of the actual commercial consumption and demand of fertilizer minerals. Determination of the production level and the general production situation at the present time, and compiling of all the requirements for obtaining the maximum production from the plants now in operation.

Second: Study of the forecast consumption and requirements of fertilizer for the purpose of expanding the area under cultivation and for the application of the most simple fertilizer formulas. Examination of the projects for the enlarging or new construction of plants, and compilation of all requirements for meeting the theoretical production target. Estimation of these figures from the viewpoint of total supply and of meeting actual and potential demands.

In addition to this subdivision of the topic, which applies to all of its aspects, there is a division into the different types of fertilizers: Nitrogen fertilizers, phosphate fertilizers, and potassium fertilizers. They will be taken up in this sequence. They

are added in this subdivision into three parts, and studied in the same manner as the mineral fertilizers, the fungicides most used for agricultural purposes, such as copper sulfate and sulfur.

Part I.

Nitrogen fertilizers.

1) Consumption of nitrogen fertilizers in Spain

Year	Total consumption of nitrogen in tons of N
1928	70,224
1929	82,731
1930	62,723
1931	60,390
1932	77,895
1933	65,585
1934	99,730
1935	73,901

The present demand for nitrogen fertilizer in Spain amounts to 140,000 tons of sodium nitrates, and 360,000 tons of ammonium nitrates, which, in terms of nitrogen, means an approximate commercial demand of 93,000 tons of nitrogen.

Only 6.8 percent of this demand can be met by domestic production, as we shall see in the following section. The rest has to be obtained from imports, which were fluctuating depending on the market and on the foreign currency situation. In 1948, when the foreign currency reserve had risen to 98,115,312 Pesetas in dollars, Belgian francs, and Italian lire, imports were as follows:

	Tons
Cyanamides	1,000
Calcium nitrate	10,222
Sodium nitrate	89,001
Ammonium sulfate	52,106
	152,329 tons

This quantity, as compared to the 500,000 tons required, gives a clear picture of the shortage of supply, with its consequences in the form of decreased agricultural production, which will be described at the end of this study.

II. Present nitrogen production in Spain.

The following plants are presently in operation:

Energia e Industrias Aragonesas, S. A.

Sociedad Iberica del Nitrogeno

Sociedad Electroquimica de Flix

We will take up only the figures of the two first plants, since those of the Flix plant are not available. Furthermore, this plant produces less nitrogen than the two others, and this only for its own uses and not for agricultural purposes.

Energia e Industrias Aragonesas, S. A.: Capital expended: 56 million Pesetas. Started operation in May 1934, with an electrolytic hydrogen generating installation, and production of ammonia by the Casale process, with a maximum capacity of ten tons of ammonia per 24 hours. The plant is located at Sabinanigo (Huesoas).

Sociedad Iberica del Nitrogeno: Capital: 78 million Pesetas. Began its operations in 1926. Its plant at La Felguera produces synthetic ammonia by the modified Claude process, with hydrogen obtained by fractionation of coke oven gas. Nitric acid is made by catalytic oxidation of ammonia. Ammonium sulfate is made with sulfuric acid of 56°Be, obtained by the lead chamber process. The maximum capacity of the plant is 30 tons of synthetic ammonia per day.

Both plants use the following basic materials: High-pressure oil (?) [aceite de alta presion], sodium and potassium hydroxide, calcium chloride, coke oven gas, coking coal, pyrite, electric power, and catalysts.

In comparing the figures of maximum production of both plants with those of their maximum capacity, we obtain the following situation:

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In comparing the figures of maximum production of both plants with those of their maximum capacity, we obtain the following situation:

Plant	Theoretical max. prod. in tons NH_3	Max. prod. reached in tons NH_3	Year	% of utilization
Energia e Ind. Aragonesas	3,650	3,155	1947	86
Soc. Iber. del Nitrogeno	10,950	2,510	1947	22

When comparing the average annual production since the start of operations with the annual maximum production, we arrive at the following figures:

Plants	Theoretical max. prod. in tons NH_3	Average prod. in tons NH_3	During the Years	% of utilization
Energia e Ind. Aragonesas	3,650	2,189.73	1927-48*	59.90
Soc. Iber. del Nitrogeno	10,950	1,123-87	1927-48	10.26

*: The dates 1927-48 are apparently a misprint, since it is stated above that the plant began operations in 1934. It should therefore probably read 1934-1948.

We see that there is a great difference between the maximum capacity and the actual output of the plants, with the percentages of output on the basis of full capacity 86 percent for the first plant and 22 percent for the second plant, and when calculated on the average, 60 percent for the first and only 10.26 percent for the second plant. To this is added the divergence between the tonnage of ammonia produced and the quantity of ammonium sulfate obtained, from which it is seen, according to the data gathered, that the percentage of the quantity of ammonia destined for the production of ammonium sulfate varied, from 99 percent in 1930 - completely normal - to 19 percent in 1948.

It is necessary to investigate and to analyze now the reasons for the low output. This will be done in the chapter entitled "requirements" of this first section.

Until now we have discussed only the synthetic nitrogen products. To the figures given here, the production of ammonium sulfate from coal distillation and gas works can be added. These figures are given in appendix 1. The maximum annual production of ammonium sulfate, on the

basis of the maximum capacity of the above plants, is 15,017.5 tons, while the actual production is 9,318 tons. But these plants are operating below their capacity at present, and while they are trying to reach it, as the studies of the Council of the coal and steel industry show, sulfates are only a by-product of these industries, and it is most unlikely that they would cause a notable increase in the above production figures.

The above shows the following:

Capacity of the plants producing nitrogen by synthesis and as by-product	14,500 tons
Maximum actual production of these plants, which include all present installations	6,500 tons
Deficit between actual production and full capacity	8,000 tons

The tremendous disparity between the 6,500 tons of nitrogen actually produced in Spain and the 93,000 tons required is quite evident. The difference, at the present time, can be made up only by imports, and their volume is never sufficiently high to cover the deficit. The result is the confusion and the lowering of agricultural production, of which we are all well aware.

This first part of the study does not deal with means of wiping out this deficit between 6,500 and 93,000 tons, except by beginning the job by taking up the question of making the plants operate at full capacity and integrating their production - in other words, to increase production from 6,500 to 14,500 tons. For this purpose, we will take up the requirements and means for reaching full capacity, together with the proper measures. For the reasons given above, we will deal only with the synthetic nitrogen plants.

III. Requirements for bringing the present plants up to full capacity production

Energia e Industrias Aragonesas

Regulation of supply of raw materials:

The supply of raw materials must be as follows:

	kg per year
Domestic products:	
High-pressure oil (?)	3,500
Sodium hydroxide	35,000
Imports:	
Potassium hydroxide	14,000
Anhydrous calcium chloride	1,500
"Armco" iron for catalysts	3,000

Transport: The "Renfe" must assign more cars for the transport from the Pasajes freight station. At present, the number of boxcars is too small, causing unnecessary delays and an irregular supply of pyrites which are transported by ship from Huelva to the above station.

Sociedad Iberica del Nitrogeno:

Electric power: The requirements can be discussed here in a few words. Basically, it is a matter of electric power which has caused the plant to work below capacity for the past years. This problem will be solved as soon as the thermal electric plant Garcia Rodrigues at Puentes has been put into service. This plant will provide the Sociedad Iberica del Nitrogeno with the necessary electric power, viz. 2,500 kW.

IV. Price of ammonium sulfate

1) Comparison with the price of ammonia

In the examination of the ammonia production of the nitrogen plants it was observed that there is a great difference between the production figures for ammonia and those for ammonia destined for the production of ammonium sulfate in both synthetic plants operating at present. The percentage of ammonium for the production of ammonium sulfate decreased from 99 percent in 1930 to 19 percent in 1948. The reason for this is the difference in the market price between liquid ammonia and ammonium sulfate, because the profits from the former are much higher.

This difference can be demonstrated as follows:

1) One kilogram of anhydrous ammonia produces 3.8 kilograms of

ammonium sulfate which, at a price of 1.20 Pesetas per kilogram, means a gross return of 4.56 Pesetas.

2) One kilogram of sulfate requires 1.13 kg of sulfuric acid of 53° Be, at 0.28 Pesetas per kilogram (not including the industrial profit from its own manufacture). Thus, 318 kilograms of ammonium sulfate, obtained from one kilogram of ammonia requires 1.064 pesetas worth of sulfuric acid (Note: Calculation seems to be wrong).

3) Therefore, the 4.56 Pesetas which would be the return to the manufacturer for ammonium sulfate made from one kilogram of ammonia, are reduced by 1.064 pesetas for the sulfuric acid used, and the return, therefore, without including labor and machinery costs, is 3.49 pesetas.

4) Finally, we must consider that a kilogram of ammonia, sold as such, costs 4.20 Pesetas, plus 1.25 for freight charges, a total of 5.56 Pesetas. There is, thus, a difference of 2.15 Pesetas in favor of the producer who sells ammonia, instead of processing it to make ammonium sulfate.

If it is desired that the present plants operate at full capacity, and that projects of enlarging the present plants and of building new ones are started, so that the production of ammonium sulfate will be in accordance with the true capacity of the plants. These conditions will stimulate production. Otherwise, the production of liquid ammonia will remain the more profitable operation, at the expense of the production of ammonium sulfate.

The necessity of raising the price of ammonium sulfate is of the same importance as the questions of raw materials, transport, power supply, etc., if the manufacture of ammonium sulfate is to be made as profitable as that of liquid ammonia and if the production is to be raised to 15,000 tons of nitrogen in the form of nitrogen fertilizers and if it is to cover the national needs.

It should be perfectly possible to achieve such a price raise without any adverse effects on agriculture, especially since the increase would mean an insignificantly higher official price as compared with the prices demanded on the greatly frequented black market,

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and will permit the farmers to buy all the sulfate they need at prices much lower than those they have to pay now in order to get enough fertilizer for a good crop.

2) Comparison with the price of imported sulfate

Since the War of Liberation the price fixed for domestic ammonium sulfate has always been so disproportionately low that it has placed Spanish industry in an inferior position to foreign industry, a veritable state of servitude, especially when it is considered that these industries are of national interest.

Imported nitrogen products - specifically speaking, English ammonium sulfate - from which practically no revenue in the form of import duty is derived, sell for 25 Pounds per ton, or 1,500 Pesetas, despite the exchange rate which is in their favor, while the Spanish manufacturer gets 1,200 Pesetas per ton. We have furthermore the paradox, that the Spanish consumer pays 1,700 pesetas per ton for domestic ammonium sulfate for which the manufacturer gets only 1,200, while the difference of 500 Pesetas goes to the Regulation Fund for Fertilizers of the Ministry of Industry and Commerce to reduce the price of imported nitrate fertilizer. These imports thus, are maintained and supported in their position of superiority with the profits created by the domestic industry.

It is impossible to develop and to support the domestic fertilizer industry, if these harmful practices are continued, since they jeopardize not only its development, but also its very existence. Therefore we come to the following conclusion from the above: increased production through the sale of ammonia and of electric power, so that the fertilizer industry may be placed in the vital position which it deserves.

V. Conclusions from Part I.

1) In order to make up the deficit between actual production of 6,500 tons and the full capacity of 14,500 tons it is necessary to satisfy the requirements of the two synthesis plants, mentioned in Chapter III. These requirements, by their small volume and by their

nature, can be met, and furthermore, must be met with absolute and most urgent priority, in order to achieve an increase in the production of fertilizers.

2) Of equal importance as the supply of the necessary material, power, transport, etc., is the necessity of revising the price of domestic ammonium sulfate, and establishing conditions which will enable it to compete with the imported product.

In order to achieve this, the following is necessary:

a) The establishing of a price for domestic nitrogen compounds more or less the same or preferably higher than that of the imported product, bearing in mind the fact that the agricultural market is perfectly able to support such prices without any ill effect, and furthermore, that there is the possibility of obtaining a greater quantity of fertilizer at a considerably lower price than the one charged in reality, due to the scarcity of this material.

b) Grant to the Regulation Fund for Fertilizer of the Ministry of Industry the proper authority, to achieve an aim opposite to the present one, namely to raise the price of domestic nitrogen compounds to the level of the imported nitrogen compounds.

Phosphate Fertilizers

1) Consumption of phosphate of fertilizers in Spain

Year	Superphosphate, tons	Year	Superphosphate, tons
1914	219,456	1924	696,213
1915	194,094	1925	722,891
1916	315,074	1926	828,605
1917	352,694	1927	950,000
1918	127,441	1928	1,160,000
1919	135,526	1929	1,005,587
1920	370,608	1930	1,148,209
1921	542,127	1931	911,778
1922	461,531	1932	1,055,773
1923	608,830	1933	979,520

Year	Superphosphate, tons	Year	Superphosphate, tons
1934	1,062,828	1942	263,625
1935	1,076,236	1943	279,550
1936	248,869	1944	535,970
1937	189,881	1945	286,524
1938 -	419,654	1946	286,524
1939	632,564	1947	365,410
1940	624,335	1948	710,346
1941	577,875		

Year	Natural phosphates, tons	Thomas slag, tons
1928	7,897	13,800
1929	7,626	2,000
1930	5,400	6,900
1932	5,300	8,500
1933	4,700	10,200
1935	7,314	8,500

It can be seen that the consumption of superphosphates varies greatly, but in general remains around 1 million tons, and that it has decreased considerably during the post-war period. The reasons for these fluctuations and for the low production of the past few years are mostly to be found in the difficulties in importing phosphates, which were increased while the French border was closed, by faulty supply of raw materials and by unreliable transport. These are matters which can be remedied as pointed out in the chapter "Requirements".

II. Production of Phosphate Fertilizer in Spain.

Superphosphate: There are 35 plants in Spain, with a total capacity of 1,750,000 tons. They all date from prior to 1934.

The basic material is phosphate, always imported from French Morocco and Algiers, except during the period of suspension of trade relations with France. During that time, the phosphates were obtained from the United States and from Egypt, under less favorable conditions, since the prices were higher.

Natural phosphates: They are obtained regularly from the phosphorite deposits of Logrosan, without which the supply of agricultural necessities would be problematical.

III. Requirements of the present plants for reaching full capacity production

Lead: The condition of the chambers for sulfuric acid production is extremely bad, so bad that the thickness of some of them has reached the technically permissible minimum. The requirements of lead for each factory, in accordance with its production, are 1,000 tons per year, or 2.4 kg of lead per ton of sulfuric acid. It is absolutely essential to provide the above quantity of lead to the superphosphate plants with the greatest regularity.

Sodium nitrate: This salt is essential in the superphosphate production process, at a ratio of 10 kg per ton of sulfuric acid, of which, in turn, 540 kg are required to make one ton of superphosphate. The supply of sodium nitrate during the past few years has been as follows:

Year	Tons
1944	2,000
1945	1,800
1946	900
1947	1,920
1948	1,350
1949 (up to the date of writing)	2,000

With the capacity of the superphosphate plants of 1,750,000 tons, the required sodium nitrate would be 9,500 tons, essential to reach this production. The supply should be handled by the Ministry of Agriculture, since the entire supply destined for the manufacture of superphosphate is returned to agriculture in the form of fertilizer.

Electric power: Electric supply for the superphosphate plants must be released from the electric power consumption restrictions in force for other industries in Spain, since these plants are overstocked

with the raw materials (phosphate and pyrite) but can operate only at 50 percent capacity due to the restricted power supply, and some factories have had to stop operations for months.

Transport: Despite the efforts made by the Government Delegation for the Coordination of Transport, there exists a serious problem in the transport of raw materials and finished products which pile up in ports and factories, causing great expenses by the filling up of storage facilities, which represent valuable real estate, and by the immobilization of capital, both most uneconomical effects from which recovery is difficult. The situation is most acute for factories in the interior of the country, where there is the danger of a shutdown, despite the fact that there is an abundant supply of raw materials in the ports of entry.

It is therefore essential that the transport which is connected with the production of superphosphate be given absolute priority by the above-mentioned Delegation and that this matter be expedited by all available means.

Taxes: It is of prime importance for the supply of the superphosphate required by agriculture that it be available to the farmer at the lowest possible price. Nevertheless, some of the taxes levied on the industrial process of the manufacture of superphosphate and on its distribution represent an obstacle, not so much because of the assessment itself, but because of the form in which it is levied. The matter is one of a transport tax which is levied as many times as the product is transported by railroad or by ship, and of dockage charges established by the decree of the Ministry of Public Works of 12 December 1948, amounting to three Pesetas per ton of imported phosphate, and to two Pesetas per ton on pyrite during the loading at Huelva, also three Pesetas per ton at the unloading ports, and five pesetas for loading or unloading per ton of superphosphate. Furthermore, if any portion of the goods is reshipped through other ports, the same taxes are levied again.

It would only be reasonable and convenient if this repeated levying

of one and the same tax were abolished and if the superphosphate production were subjected to the payment of these taxes and dockage charges in one instance only.

Conclusions: For the full utilization of the domestic superphosphate plants and in order that they attain full capacity production of 1,750,000 tons, the following measures must be taken:

1) Regulation of phosphate imports
2) Guarantee of a lead supply of 1,000 tons per year
3) Direct allocation by the Ministry of agriculture of 9,500 tons of sodium nitrate per year
4) Increase of the supply of electric power as far as possible
5) Assigning to the transport of raw materials and finished products the highest priority, and increasing the number of freight cars available
6) Easing of the load of freight and dockage charges

Attainment of full production will make the expenditure of foreign currency for the importation of superphosphate, unnecessary. It will also guarantee that all requirements of Spanish agriculture are met and will leave quantities free for export, thus contributing greatly to the development of domestic industry.

Potassium fertilizers:

1) Consumption of potassium fertilizers in Spain

The only available data concerning the consumption of potassium oxide (K_2O) in Spain for the years before 1936 is as follows:

	Aver. 1926-1930	1931	1932	1933
K_2O, tons	26,100	25,500	23,600	24,000

These figures still are approximately valid at the present time, since the branches of agriculture which use this type of fertilizer have not changed greatly since then.

Potassium chloride and potassium sulfate are the only ones which are important as fertilizers. Of these two, the one in most ample supply and in greatest demand in Spain is the chloride. With potassium chloride as the starting point, by treatment with sulfuric acid, free hydrochloric acid and potassium sulfate are obtained, the latter having a purity of 95%. This is the only source of production of this fertilizer.

Despite the fact that the potassium sulfate has much better protertics as a fertilizer than the chloride, production in Spain overwhelmingly favors the latter, because of the small margin of profit obtained from turning chloride into sulfate. When the prices of the sulfuric acid, the profit made on the hydrochloric acid produced, the difficulties of manufacture, the cost of the installations and of labor, etc. are considered, it becomes more profitable to sell the potassium chloride than to make potassium sulfate from it. The following table provides a good illustration of this fact:

II. Production of potassium sulfate

Year	kg
1945	2,164,974
1946	1,468,098
1947	1,936,506
1948	1,498,265

III. Production of potassium chloride

The figures are those of the production of the plants of Suria, Union Espanola de Explosivos, Potasas Ibericas S. A., and Exportadora de Potasas S. A., from 1930 to 1948. They are shown in Appendix 4, and amount to a total of 164,942 tons of K_2O in 1948, or 980 tons of potassium chloride extracted.

From these figures it is evident that Spain imported potassium salts until 1936, although on a decreasing scale, and since the War

of Liberation has made herself completely independent, supplying her own needs and exporting increasing quantities each year. There is thus, at present, no problem in the supply of potassium fertilizers for Spanish agriculture.

FUNGICIDES

Copper sulfate

The fungicides based on copper which are used in Spain are copper sulfate, copper oxychloride, copper carbonate, copper sulfide and copper sprays made of the above substances. Of all these, the most important and the one which has bearing on the national economy is copper sulfate.

I. Copper sulfate consumption in Spain

	Average 1926-1930	1931	1932	1933	1935
Copper sulfate, tons	11,800	12,000	13,400	14,800	15,555

This last figure of approximately 16,000 tons can be considered the present consumption figure, since the use of fungicides has undergone no great change in regard to quantity since then.

II. Copper sulfate production in Spain

The raw materials used are metallic copper and sulfuric acid. The industrial process is simple, ans is the same in all plants, requiring 24 to 26 kilograms of metallic copper for every 100 kg of sulfate.

Since Spain produces sulfuric acid in sufficient quantity for all her needs, the basic problem in the production of copper sulfate is a supply of copper. Thus, the entire question of production hinges upon the availability of this metal.

The domestic plants which make copper sulfate in quantities sufficient to cover both domestic needs and exports, are the following:

Sociedad Anonima Cros, Badalona

Sociedad Anonima Cros, La Coruna, El Burgo, Santiago

Vicente Ros, Martorell

Industrias Quimicas del Valles, Mollest

Fabricas Quimicas S. A., Valencia

Union Espanicla de Explosivos, Madrid (Cerro de la Plata)

Union Espanicla de Explosivos, Sevilla

Sociedad M. y M. de Penarroya, Penarroya

Compania Navarra de Abonos Quimicos, Pamplona.

The Spanish market suffers from a decreasing supply of copper, due to the reduced domestic production and to the difficulties in obtaining imports. The following are believed to be the reasons for the drop in domestic copper production:

a) The drop in prices in 1930 and the following years, which caused the closing down of several mines

b) Exhaustion of some copper deposits

c) The gradual decrease in the copper content in pyrites, at increasing depths which has reached the point where some mines have gone over completely to iron pyrite mining. The copper of the pyrites is found in the form of minerals of primary and secondary grade mixed together and at still greater depth the ratio of secondary minerals decreases and that of the chalcopyrite, an unmanageable material, increases.

d) The lack of a market for iron pyrite. This and the iron-copper pyrite are found in a mixed state, and it is convenient for the proper and economical exploitation of the deposit to mine them together.

For these reasons, the copper production has dropped, and the scarcity can be alleviated or eliminated if the problem is tackled from the metallurgical point of view. But since this is outside the scope of this study, it must be limited here to the form of a suggestion.

The production of copper sulfate in Spain has taken the following course:

Between 1920 and 1925, the imports of this product could be canceled because of domestic production which was able to meet any requirement. The Spanish manufacturers had to fight the foreign producers with difficult technical and commercial means, solely on the grounds of their good technical and commercial methods, since the state provided no tariff protection. In those days it was possible to supply all needs of Spain, either by domestic production or by export, a "conditio sine qua non" for the proper functioning of the above-mentioned industries.

Since our War of Liberation the difficulties with regard to the availability of copper have increased, and it became necessary to import copper sulfate to satisfy the domestic requirements. In 1946, domestic production of this salt was resumed, and metallic copper was allocated to the plants for this purpose. Nevertheless, the copper supply to the plants is unreliable and contingent upon the availability of the metal at the moment. This is shown in the table of copper sulfate production shown below, with the production based on the supply of copper:

Year	Tons
1946	10,036
1947	256
1948	3,492
1949	4,000

In general, the lag between domestic production and consumption of copper sulfate has been decreased by means of imports of sulfate, although the latter have never reached the full quantity required and which, furthermore, frequently arrived at the wrong time. This brings up the question of whether it is better to import

metallic copper to be processed by the domestic plants. The latter alternative, viz. the importation of copper, is certainly the better one, since it has the following advantages:

1) Saving of foreign currency on the following items: Sulfuric acid used, capital, labor, and transport from the foreign port, packing, freight charges for the difference in weight between copper and copper sulfate, waste, loss of sulfate due to breakage of packing, etc.

2) Considerable saving in foreign currency on the difference in price between copper and copper sulfate. This is explained when it is considered that one kilogram of sulfate contains 250 grams of metallic copper. With a price of 10 Pesetas per kilogram of copper, it contains 2.50 Pesetas worth of copper. The price of copper sulfate is fixed at 5.50 Pesetas per kilogram. This amounts to a difference of three Pesetas per kilogram of copper sulfate, which we could pay in Pesetas, while at present we have to spend foreign currency. Thus, if we import the required quantity, 16,000 tons of sulfate, we have to pay the equivalent of 48,000,000 Pesetas in foreign currency per year.

3) Work provided for the domestic copper sulfate industry, with all the economic and social consequences, another step forward in the industrialization of the country and toward the elimination of importation of labor, the traditional shortcoming of our economy.

We do not ignore the difficulties involved in the importation of metallic copper in the quantities required, considering the present copper situation in the world market, even though this situation may be temporary. This study, however, is designed to point out the advantages and the necessity of using all means to import metallic copper instead of copper sulfate.

III. Requirements of the present plants for reaching full capacity production

The above shows that the existing domestic plants, like those manufacturing potassium fertilizers and those making phosphate fertilizers, have a sufficient capacity for supplying agriculture with the full quantity of copper sulfate required.

The problem is that of importing the necessary metallic copper, the basic material for the industrial process; this problem can be solved in accordance with the two following points:

1) Importation of copper instead of copper sulfate on the largest possible scale.

2) Importation of the amount of copper, which cannot be produced domestically, to fill the requirements of 4,000 tons per year. The importation has to be carried out in such a manner that the sulfate plants can dispose of the copper before the month of January. After January, the campaign for utilizing the product at the places of consumption must get under way.

The other requirements for the attainment of full capacity production by the copper sulfate plants consist in their being supplied on time by the organizations charged with the supply of the following materials: a) Fuel oil, b) Glycerine, c) Coal. The exact figures for the necessary supply of these materials need not be determined here, since, as stated above, the primary requirement is the supply of metallic copper. Furthermore, the question of fuel oil supply depends on imports, and a study is being made on the possibilities of increasing coal production in Spain.

SULFUR

Consumption of sulfur in Spain.

The present consumption of sulfur in Spain for agricultural purposes is approximately 25,000 tons. A like quantity is used for industrial purposes. The details of these two fields of consumption, agriculture and industry, are shown in appendices 5 and 6, which correspond to the official reports whose relation with domestic production

will be studied later on.

Production of Sulfur in Spain.

Sulfur is obtained from two sources:

a) From quarries, mines, or deposits, in its natural state.

b) From sulfur dioxide obtained by roasting pyrites, which contain between 46 and 51% of sulfur by weight.

The production of sulfur by mining rose from 700 tons in 1900 to 12,000 tons in 1920, and in the years following reached 20,000 tons. But then it continued to decrease, because the deposits were becoming exhausted, so that in 1948 the production was down to 3,000 tons. This figure is only 10% of domestic production, and covers only 6% of domestic requirements, so that it can be said that there is practically no longer any mining of sulfur in Spain. The rich minerals have already been extracted and the construction of new sites of exploitation is connected with such high costs that only the certainty that a rich deposit will be struck can make up for these expenditures.

Since 1930, when the Riotinto mine first started the process of utilizing sulfur from pyrite in one of its furnaces which had been rebuilt according to a Norwegian patent, the conversion of sulfur dioxide has been the main source of the domestic production of oxide sulfur, until it reached 90% of the production of 31,000 tons in 1948. Appendix 7 shows the production of crude sulfur in Spain since 1922.

At the present, the special circumstances at the Riotinto mines which are foreign owned prevent nearly all means of increasing the amount of sulfur obtained from pyrite, although there is the impression that large unexploited veins are present. But since the production of sulfur is linked up with that of copper, the former cannot be increased without upsetting the production structure of both, which would be a very costly matter and which the mine management has so far refused

to do, for the above reason and because it is not certain of the feasibility of such measures.

The deficit between the domestic production and consumption has been covered until now by the importation of sulfur, which involved a great expenditure of foreign currency. At the same time it must be borne in mind that there is no guarantee that the Riotinto mine will be able to maintain its present output, which, according to all indications, seems to be decreasing.

There is, however, a possibility of increasing domestic production to fill all needs regularly and at low price. This possibility is the only one, since mining of sulfur must be dismissed due to the fact that the deposits are becoming exhausted and the roasting of pyrites at Riotinto must be discarded as a possibility for the above-named reasons. The importing of sulfur cannot be considered, since it is too great a drain on our foreign currency reserves.

The new method consists of the process of recovering sulfur from the sulfides in zinc and blende minerals. Large deposits of these exist at Hinojedo-Torrelaguna (Santander) and are owned by the Real Companie Asturiana de Minas. This company has a new plant for the roasting of the mineral. The details and the requirements of this plants are to be seen from the second part of this study. Suffice it to say that this installation, once put into operation, will yield 20,000 tons of sulfur, a quantity which can be increased as more mineral is mined. This would not only make Spain self-sufficient in regard to sulfur, but would turn her into an exporting country.

(To be continued)

Note: The appendices mentioned are not included here. They are probably contained in the continuation of this article in another issue of the publication.